Interaction Practice

Data

For this assignment, you will consider a dataset simulated according to material published in Brody et al. 2014 (Note: reading the article is not required). Earlier in Perusall you saw a talk on "Unnatural Causes" by Dr. David Williams that provides context and refers to the Brody study.

You can access the data at: https://sldr.netlify.app/data/brody-allostatic-load.csv

Use the data to answer the questions below.

The response variable in your model will the Allostatic Load Index `ALI`.

Questions

1. **Diagram** Draw a causal diagram (or, work through the model planning checklist). Try to make it consistent with Brody and colleagues' discussion of their study, quoted below. **To do so you will need to include at least one interaction in which a variable moderates the relationship of your key predictor of interest with the response.**

> The research literature has shown perceived racial discrimination to be correlated with the confounder variables [SES = socio-economic status, perceived life stress, depressive symptoms, and unhealthy behaviors]; therefore, we controlled them in the data analyses. These variables might be expected to serve as mediators linking perceived discrimination with AL… From a myriad of options that merit exploration, we suggest that future research begin with a focus on the regulation of negative emotions. One consistent consequence of perceived discrimination is the development and expression of elevated levels of anger and hostility (Brody et al., 2006), which have been shown to influence physiological functioning across several systems. For example, hostility has been associated with amplified blood pressure reactions to stress (Fredrickson et al., 2000), elevated fasting glucose (Shen, Countryman, Spiro, & Niaura,

> 2008), and heightened plasma lipid levels (Weidner, Sexton, McLellarn, Connor, & Matarazzo, 1987). Elevated levels of anger forecast CRP levels in adolescents (Brody et al., 2013). Whether anger and hostility mediate the association of perceived discrimination with AL remains an open question, but they remain prime candidates for this role….Several limitations of this study should be addressed in future research. First, the discrimination measure assessed interpersonal discrimination only, rather than structured or institutional discrimination [but]… the present study is among the first to show a positive, prospective association between perceived discrimination and AL. It also highlights the benefits of supportive relationships in ameliorating this association and underscores the importance of supportive relationships in keeping stress from "getting under the skin." –Brody et al. 2014

2. **Plan** Interpret your diagram (plus the n/15 rule) to articulate your model plan for the model *you* will fit to the data. **This might match up with what you just did for #1, or you can make changes if you think differently that Brody and colleagues!**
3. **Explore – optional/if time permits** Read your data into R and make a one well-designed exploratory plot of the data including the response variable and at two interacting predictors. (This is optional to use your limited in-class time on new stuff, but great to do if you can.)
4. **Fit** a linear regression model that is consistent with your model plan. Show its `summary()` and write down its equation. (Refer to: https://connect.cs.calvin.edu/STAT341/symbols/ as needed.)
5. **Optional/if time permits: Assess** your model. Show all your work: for any graph, state which condition(s) you are checking, whether the condition(s) are met, and how you know. (This is optional *only* to save in-class time.)
6. **Conclusions** Show any needed **model selection results** and **at least *one* prediction plot - remember interacting predictors must be shown together in a single graph, not one-by-one.** (*You **may** use the `ggpredict()` shortcut!*). Based on these, and on all your work so far (don't forget the assessment results), what can you conclude about the relationship between your key predictor of interest and the response?

What to hand in

Wait, what? Hand in?

Yes: You're asked to write up and hand in (part of) your work instead of an individual practice assignment next week.

Submissions are due next Tuesday.

You are encouraged to submit one report per group (with all names on it!) but may submit individually if desired.

You may submit all your work, but you'll get credit for (and feedback on) only the following parts:

1. Plan and checklist - does it include an interaction?
2. Model selection - Figure out and explain: is your key predictor associated with the response?
3. One prediction plot *showing both the interacting variables*
4. Conclusions (taking into account selection results for the interacting predictors and the prediction plot, and noting the lack of assessment results - which you'd need to know whether your conclusions are valid or not - if you didn't do it). These can be in bullet-point form if time limited.

Notice: the model equation is not part of the material to hand in…